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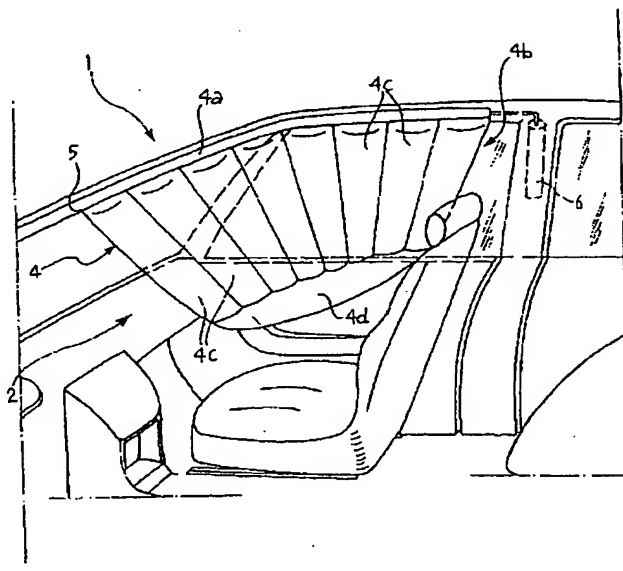
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**(54) An airbag safety restraint for a motor vehicle**

(57) The restraint (2, 3) comprises a curtain-type airbag (4) which is housed, in a folded, stowage configuration, in a housing (5) formed in the passenger compartment roof, and which can be inflated in order to adopt a configuration in which it is unfolded downwards as a result of the activation of an associated gas generator (6). The housing (5) and the airbag (4) stowed therein extend along an angled or arcuate line (5) par-

tially along a longitudinal edge of the passenger compartment roof and partially transversely relative to the longitudinal edge. The airbag (4) includes a lower tubular element (4d) which, when inflated, can contract longitudinally in a manner such that, in the inflated and unfolded condition, it brings about a shortening of the lower portion of the airbag (4) and is disposed substantially along a diagonal or a chord, at an inclination to the longitudinal axis of the motor vehicle.

FIG. 2



## Description

[0001] The present invention relates to a safety restraint for protecting a person in the passenger compartment of a motor vehicle.

[0002] More specifically, the subject of the invention is a safety restraint comprising:

a curtain-type airbag which is housed, in a stowage configuration, in a housing formed along an edge of the passenger compartment roof and which can be inflated in order to adopt a configuration in which it is unfolded downwards, as a result of the activation of an associated gas generator.

[0003] Airbag safety restraints of this type have been proposed for fitting along a portion of the side edge of a motor-vehicle roof. In the unfolded configuration, the airbag of a restraint of this type is unfolded and falls down beside the inside of a door or side panel of the motor vehicle to protect the person occupying the adjacent seat in the event of a side impact.

[0004] These safety restraints have been proposed for fitting in combination with conventional airbags which are located at the front, that is, for inflation in front of the occupant of a seat.

[0005] The object of the present invention is to provide a safety restraint of the above-mentioned type which can protect a seat occupant both in the event of a front or rear impact, and in the event of a side impact.

[0006] This and other objects are achieved, according to the invention, by a safety restraint, characterized in that the housing and the airbag stowed therein extend along an angled or arcuate line, partially along a longitudinal edge of the passenger compartment roof and partially transversely relative to the longitudinal edge, and in that the airbag includes a lower tubular element which, when inflated, can expand radially and contract longitudinally in a manner such that, in the inflated and unfolded condition, it brings about a shortening of the lower side of the airbag and is disposed substantially along a diagonal or a chord, at an inclination to the longitudinal axis of the motor vehicle.

[0007] Further characteristics and advantages of the invention will become clear from the following detailed description, given purely by way of non-limiting example with reference to the appended drawings, in which:

Figure 1 is a plan view of a motor car provided with four safety restraints according to the invention,

Figure 2 is a partial perspective view showing a safety restraint according to the invention in the unfolded and inflated configuration,

Figure 3 is a plan view of the car shown in Figure 1 with the safety restraints shown in the inflated and unfolded condition, and

Figure 4 is a plan view of another motor car provided

with four safety restraints according to the invention, fitted in an alternative arrangement.

[0008] In Figures 1 to 3, a motor car is indicated 1. Two front safety restraints 2 and two rear safety restraints 3 are fitted in the roof of the passenger compartment of the motor car.

[0009] As will become clearer from the following, each safety restraint 2 or 3 comprises a respective airbag such as that indicated 4 in Figure 2, housed in a folded, stowage configuration in a respective housing 5 (Figure 1) formed in the passenger compartment roof and extending along an angled or arcuate line partially along a longitudinal edge of the roof and partially transversely relative to that edge.

[0010] In the embodiment shown in Figure 2, the airbag 4 of each restraint comprises an upper tubular element 4a restrained in the associated housing 5 and an intermediate portion 4b divided into a plurality of adjacent chambers 4c. These chambers communicate with the region inside the upper tubular portion 4a of the airbag. At the bottom, the intermediate portion 4b of the airbag 4 is connected to a tubular element 4d. The region inside this tubular element communicates with the region inside at least one of the chambers 4c of the intermediate portion of the airbag.

[0011] The lower tubular element 4d is formed in a manner such that, when inflated, it can expand radially and contract appreciably longitudinally so as to bring about a shortening of the lower portion of the airbag 4, as can be seen in Figure 2.

[0012] The lower tubular element 4d is formed, for example, by the technique known from the document "ITS - A New Restraint System for Side Impact Protection" by Y. Gershon et al., SAE Technical Paper Series No. 961018, International Congress & Exposition, Detroit, Michigan, 26-29th February 1996.

[0013] As stated above, in the inflated and unfolded condition of the airbag, the lower tubular element 4d contracts longitudinally, bringing about a shortening of the lower portion of the airbag and being disposed substantially along a diagonal or a chord, at an inclination to the longitudinal axis of the motor vehicle, as can be seen in Figure 3.

[0014] As can be appreciated from an observation of Figures 2 and 3, in the unfolded condition, each airbag 4 can thus offer protection to the occupant of the associated seat both in the event of a front impact and in the event of a side impact.

[0015] Naturally, a respective gas generator of known type such as that indicated 6 in Figure 2 is associated with each restraint 2 or 3. In the embodiment shown by way of example, the gas generators associated with the various restraints can be mounted in respective receptacles or housings provided in the side pillars or even in the roof itself. The gas generators associated with the restraints are activated when required, in known manner, by an electronic control unit, not shown, connected

to sensors, also not shown, arranged to detect, in predetermined manner, the conditions in which it is appropriate to active the restraint or restraints.

[0016] Figure 4 shows a motor car 1 in which each of the restraints 3 associated with the rear seats comprises a respective airbag which is similar to that described above and which is stored, in the stowage condition, in a corresponding housing 5 extending partially along a portion of the longitudinal edge of the passenger compartment roof and partially behind a rear passenger seat, in particular, adjacent the upper edge of the rear window.

[0017] In the embodiment of Figure 4, the rear restraints 3 are intended to be activated in the event of a side impact or a rear impact, in the latter case to protect the occupants of the rear seats from so-called "whiplash".

[0018] Naturally, the principle of the invention remaining the same, the forms of embodiment and details of construction may be varied widely with respect to those described and illustrated purely by way of non-limiting example, without thereby departing from the scope of the invention as defined in the appended claims.

#### Claims

1. A safety restraint (2, 3) for protecting a person in the passenger compartment of a motor vehicle (1), comprising a curtain-type airbag (4), which is housed, in a folded, stowage configuration, in a housing (5) formed along an edge of the passenger compartment roof and which can be inflated in order to adopt a configuration in which it is unfolded downwards as a result of the activation of an associated gas generator (6), the restraint being characterized in that the housing (5) and the airbag (4) stowed therein extend along an angled or arcuate line (5), partially along a longitudinal edge of the passenger compartment roof and partially transversely relative to the longitudinal edge, and in that the airbag (4) includes a lower tubular element (4d) which, when inflated, can contract longitudinally in a manner such that, in the inflated and unfolded condition, it brings about a shortening of the lower portion of the airbag (4) and is disposed substantially along a diagonal or a chord, at an inclination to the longitudinal axis of the motor vehicle.
2. A motor vehicle (1) characterized in that it is provided with at least one restraint (2, 3) according to Claim 1.
3. A motor vehicle according to Claim 2, in which a restraint (2) is disposed in the front portion of the passenger compartment and the airbag (4), in the stowage condition, extends partially along a portion

of the front edge of the passenger compartment roof, facing a front driver or passenger seat, and partially along the side edge of the roof, adjacent the seat.

4. A motor vehicle according to Claim 2 or Claim 3, in which a restraint (3) is provided in the rear portion of the passenger compartment and the airbag (4), in the stowed condition, extends partially along a transverse median line of the roof facing a rear passenger seat, and partially along a portion of the side edge of the roof adjacent the seat.
5. A motor vehicle according to Claim 2 or Claim 3, in which a restraint (3) is provided in the rear portion of the passenger compartment and the airbag (4), in the stowed condition, extends partially transversely behind a rear passenger seat and partially along a portion of the side edge of the roof adjacent the seat.

FIG. 1

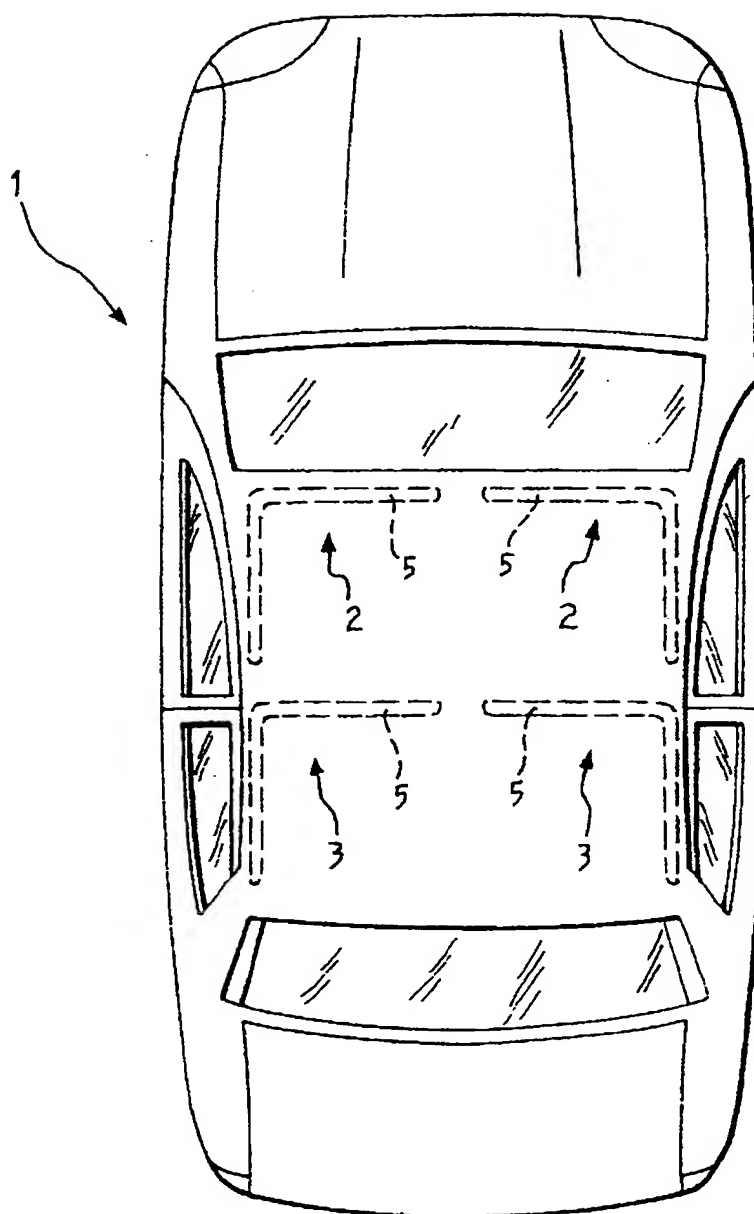


FIG. 2

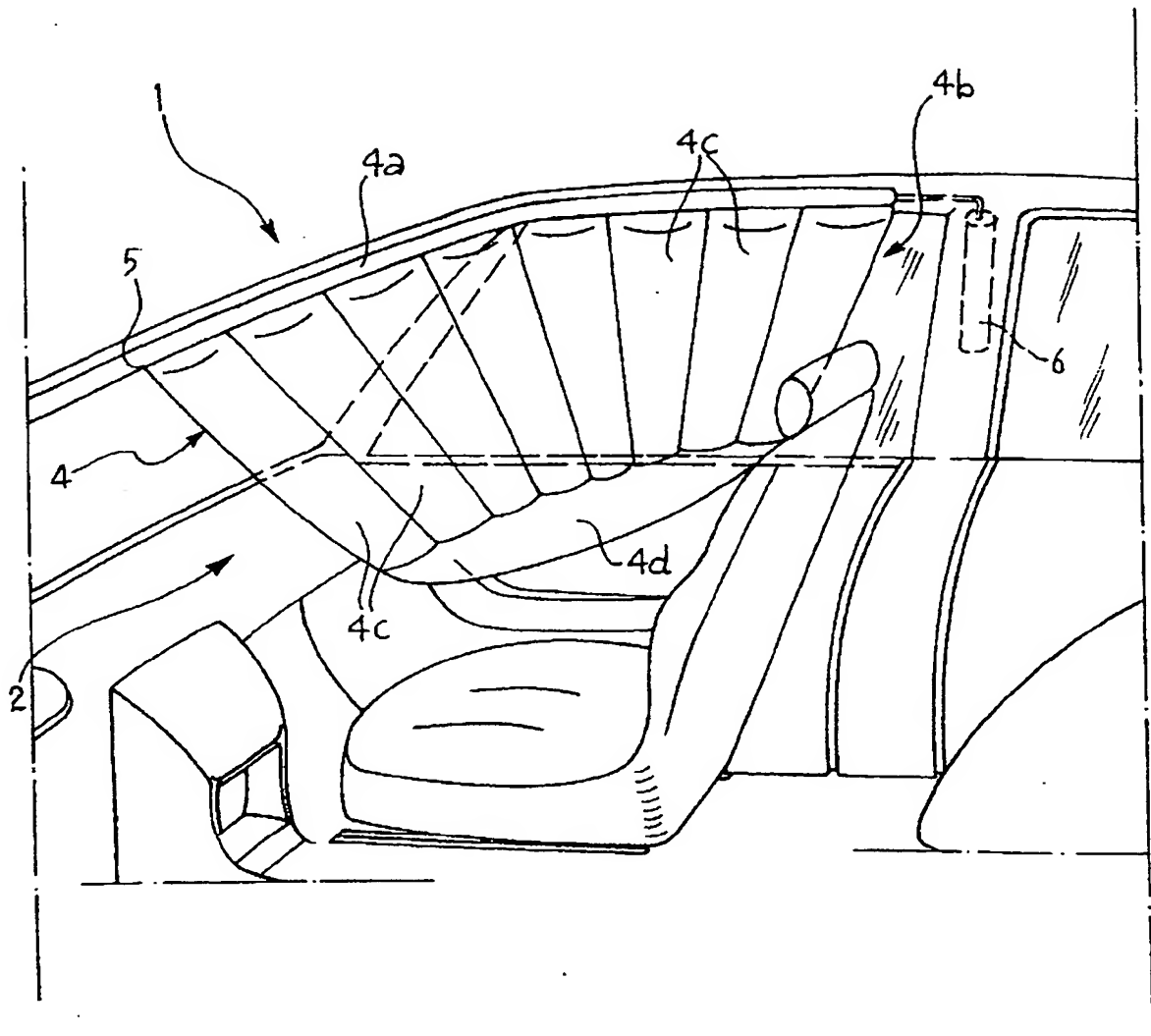


FIG. 3

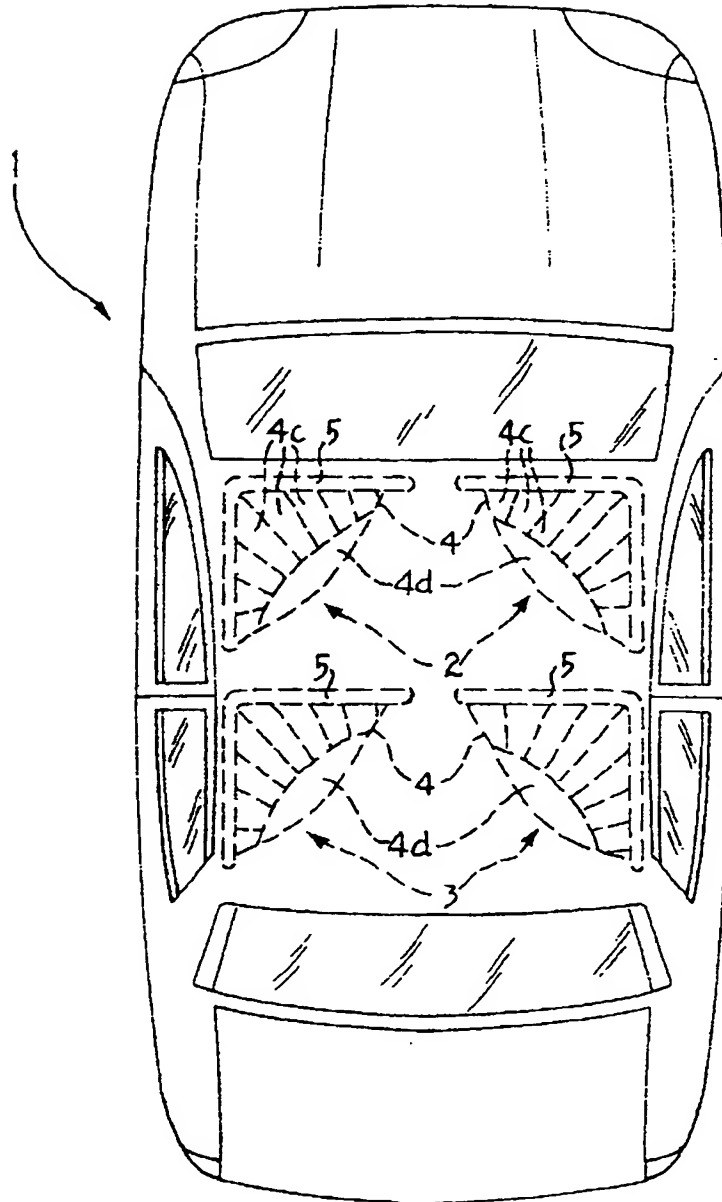
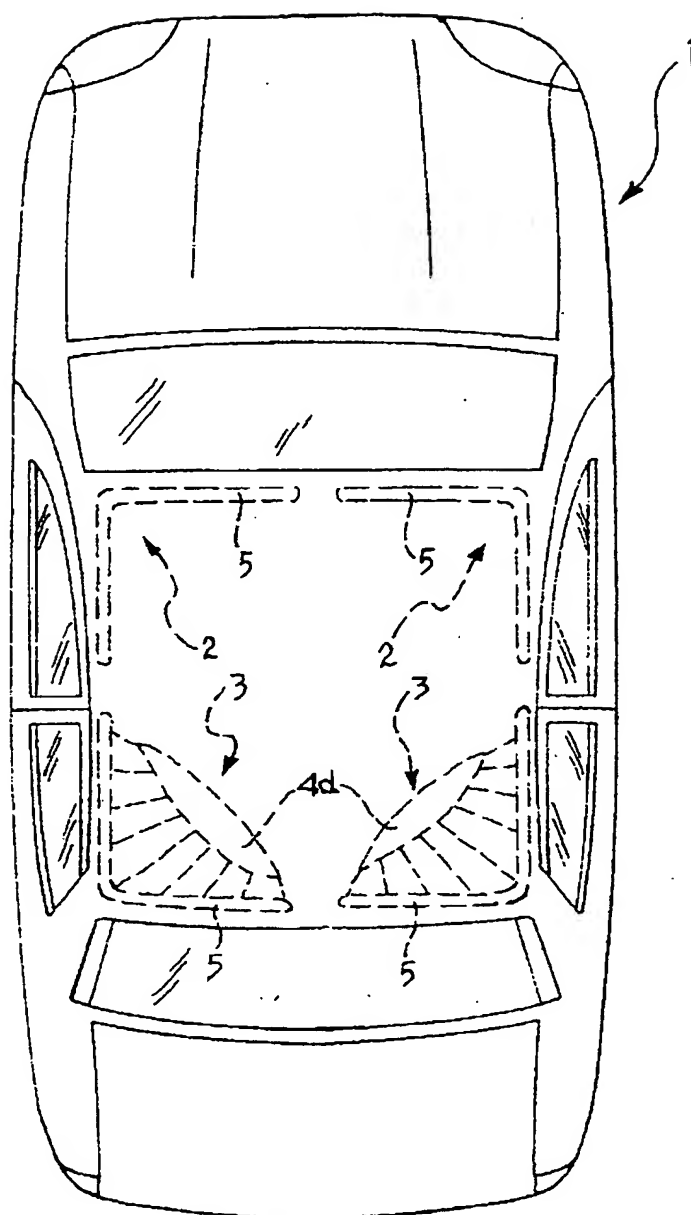


FIG. 4





European Patent  
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Application Number  
EP 00 12 7730

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A	DE 197 45 872 A (VOLKSWAGENWERK AG) 22 April 1999 (1999-04-22) * column 2, line 55 - column 3, line 28; figures 1-3 * * column 3, line 37 - line 44; figure 6 *	1-4	B60R21/22
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A	US 5 470 103 A (GRIDLEY LEE E ET AL) 28 November 1995 (1995-11-28) * the whole document *	1-4	
A	EP 0 847 904 A (BREED AUTOMOTIVE TECH) 17 June 1998 (1998-06-17) * column 4, line 50 - column 5, line 52; figures 1A, 1B *	1	
P, A	WO 00 41919 A (AUTOLIV DEV ; ERIKSSON DICK (SE); HAALAND YNGVE (SE); PIPKORN BENGT) 20 July 2000 (2000-07-20) * page 20, paragraph 3 - page 23, paragraph 1; figures 17, 18 * * page 23, paragraph 3 - page 24, paragraph 1; figure 20 *	1-3	TECHNICAL FIELDS SEARCHED (Int.Cl.7)  B60R
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>12 April 2001</b>	Examiner <b>Dubois, B</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons S : member of the same patent family, corresponding document			

EPO FORM 503 03.82 (P/4001)



**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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